



Dart Aerospace Ltd.
1270 Aberdeen St
Hawkesbury, ON
K6A 1K7
Canada

Tel (613) 632-5200

D412-664-443TRN
Job Sheet 171102



Part No: D412-664-443TRN

Job Qty: 1 ea

Part Name: Crosstube Turning Detail



Part Weight: 0 lbs

Status: Scheduled

Priority: Medium

Job Created: 1/28/18

Job Tracking No:

Due Date: 2/2/18

Created By: Marie Lajeunesse

Type: Stock

Description:

Note: D412-664-443 REV.B IPP REV:A NEW ISSUE 13-09-26 JLM VERIFIED BY:DD

Ship Via:

Bill of Materials

Job Routing

Op No	Operation	Qty	Start Date	Due Date	Standard		Workcenter/Supplier		Sign-off
					Setup Hrs	Run Hrs	Workcenter / Supplier	Lead Time	
90	Start up Operation	1 Ea		2/1/18	0.00	0.00	Start Up Crosstubes-2		
100	Mori Seiki	1 pcs		2/1/18	3.09	4.00	Mori Seiki TL-40		
110	QC	1 pcs		2/1/18	0.00	0.00	QC2-3		
120	Mori Seiki	1 pcs		2/1/18	0.00	4.00	Mori Seiki TL-40		
130	QC	1 pcs		2/1/18	0.00	0.00	QC2-3		
140	QC	1 pcs		2/1/18	0.00	0.00	QC8		
150	Crosstubes	1 pcs		2/2/18	0.00	0.63	Crosstubes-2		
180	QC	1 pcs		2/2/18	0.00	0.00	QC5		
190	Packaging	1 pcs		2/2/18	0.00	0.00	Packaging3-2		
200	QC21-SA	1 Ea		2/2/18	0.00	0.00	QC21		

Part Op 100 - 1-Cut tube on chop saw, leave extra mat'l for facing and instal plugs 412-443 on both ends 2-Face both sides of tube to length. 3-turn tube on both sides using program #2000 as per folio FB216 4--turn tube on both sides using program #3000 as per folio FB216 FOLIO REV: N/A DWG REV: B 5-Blend transition lines using belt sander with 60 grit sand paper

120 - 1-Turn tube on both sides using program #4000 and folio FB216 2-Turn tube on both sides using program #5000 and folio FB216 3-Blend transition lines using belt sander with 60 grit sand paper 4-SCRIBE PART NUMBER AS PER DWG

130 - PERFORME ULTRA SONIC MESURMENTS

150 - Grind machining marks smooth longitude way.

190 - LOCATION : LG003

Job BOM

Part / Item	Component Name	Quantity	Operation	Container
D6020-160	Crosstube Material	1 Ea (1 ea)	90-Start up Operation	

Job Allocations

Operation	Component Part	Required	Inventory	Allocated
90-Start up Operation	D6020-160	1	54	0

B/M 823

Part Specifications

Specifications could not be found.

DQA: _____ Date: _____

WORK ORDER NON-CONFORMANCE / UPDATE



QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION ☐ Rew ☐ Sc ☐ Use-a ☐ Suspected Unappro
Date : _____	Step #: _____
Description Work Order Deviation	

Container No: S042598

Part: D412-664-443TRN
Serial No/Batch: S042598
Revision: D412-664-443
Inspector: _____

Date: 02/15/18 11:07 AM

DART Aerospace Ltd.
 1270 Aberdeen Street
 New Bedford, MA 01944
 TEL: 508 533-8200
 Email: sales@dartaero.com
 www.dartaerospace.com

Root Cause			FAULT CATEGORY							
Environment	☐	No Re-verification	☐	Pressure/Forced	☐	Temperature/Cure	☐	Power Loss/Surge	☐	Positioned Wrong
Design	☐	Operator	☐	Bending	☐	Set-up	☐	Folio/Program	☐	Outside Dimensions
Doc/Data	☐	Offset/Setup	☐	Centre Not Concentric	☐	BOM/Route	☐	Grain	☐	Over/Under tolerance
Equip/Tooling	☐	Supplier	☐	Cracks	☐	Broken/Damage/Defect	☐	Weld	☐	Part Incorrect
Handling/Pre	☐	Training	☐	Crimp/Kink/Ripple/Wave	☐	Inspection Incomplete/Unqualified	☐	Wrong Stock Pulled	☐	Part Lost/Missing
Material	☐	Use for Testing	☐	Cuffs	☐	Contamination	☐	Out of Sequence	☐	Part Moved
Internal Transport	☐	Poor Information	☐	Crushing	☐	Countersink	☐	Off-set	☐	Drawing
Tribal Knowledge	☐	Rushing	☐	Heat Treat	☐	Cut Too Short	☐	Mislabeled	☐	Finish
LOA	☐	Product Improvement	☐	Wave/Twist in Tube	☐	Instructions Incomplete/Unclear	☐	Fit/Function	☐	Misread
Substation	☐	Process Improvement	☐	Marks/Chatter	☐	Drill Holes	☐	Misaligned/off center	☐	Turning Sequence
Past Expiry Date	☐	Manufacturing Process								
Misidentified	☐	Past Due	OTHER : _____							

DART AEROSPACE LTD	Work Order:	171102
Description: Crosstube Assembly (412 High Aft SS)	Part Number:	D412-664-443
Inspection Dwg: D412-664-443 Rev: B		Page 1 of 2

FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet	Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.776	+0.005/-0.000	2.781	✓		BLM 2-3" 04	
	2.776	+0.005/-0.000	2.781	✓		BLM 2-3" 04	
	2.880	+0.005/-0.000	2.885	✓			
	2.990	+0.005/-0.000	2.9935	✓		↓	
	3.100	+0.005/-0.000	3.105	✓		BLM 3"-4" 05	
	3.250	+0.005/-0.000	3.255	✓		BLM 3"-4" 05	
	7.980	+/-0.060	7.991	✓		VERN 08	
	R0.063	+/-0.010	.063	✓		RG	
	R0.500	+/-0.010	.500	✓		RG	
	2.990	+0.005/-0.000	2.9945	✓		VERN 08	
	2.776	+0.005/0	2.781	✓			
SIDE B	2.776	+0.005/-0.000	2.781	✓		BLM 2-3" 04	
	2.776	+0.005/-0.000	2.781	✓		↓	
	2.880	+0.005/-0.000	2.885	✓			
	2.990	+0.005/-0.000	2.9945	✓		↓	
	3.100	+0.005/-0.000	3.105	✓		BLM 3"-4" 05	
	3.250	+0.005/-0.000	3.254	✓		BLM 3"-4" 05	
	7.98	+/-0.060	7.987	✓		VERN 08	
	R0.063	+/-0.010	.063	✓		RG	
	R0.50	+/-0.010	.500	✓		RG	
	Ø2.990	+0.005/-0.000	2.995	✓		VERN 08	
	2.776	+0.005/0	2.781	✓			
	130.10	+/-0.060	130.1	✓		TAPE	

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

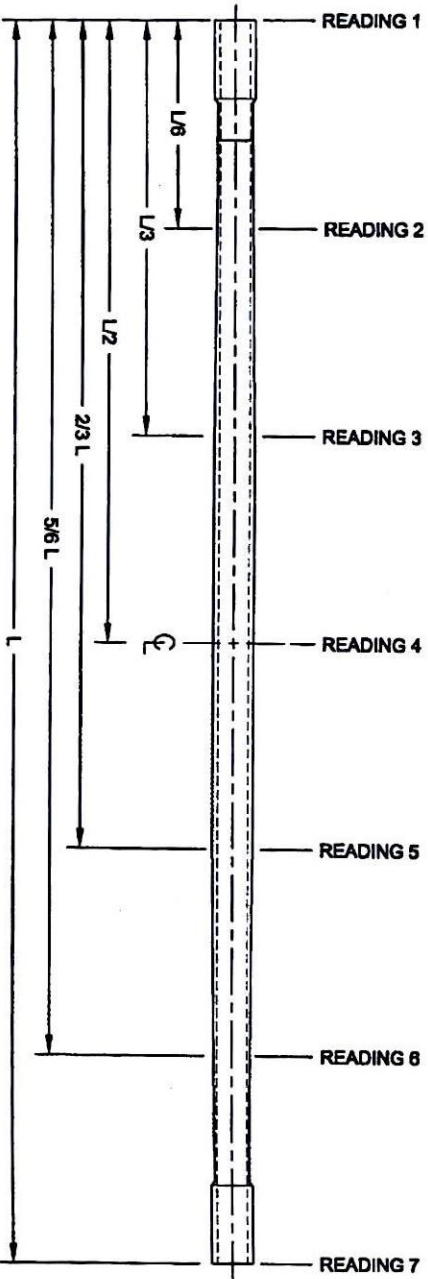
QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐				
Date :	Step #:	QTY Effective :			MRB (QSI042) Approval	
Description Work Order Deviation		Disposition			Completed By	
					Lead hand / Supervisor Approval Verification	
					QC / QA Coordinator Approval	
Root Cause		FAULT CATEGORY				
Environment ☐ Design ☐ Doc/Data ☐ Equip/Tooling ☐ Handling/Pre ☐ Material ☐ Internal Transport ☐ Tribal Knowledge ☐ LOA ☐ Substation ☐ Past Expiry Date ☐ Misidentified ☐	No Re-verification ☐ Operator ☐ Offset/Setup ☐ Supplier ☐ Training ☐ Use for Testing ☐ Poor Information ☐ Rushing ☐ Product Improvement ☐ Process Improvement ☐ Manufacturing Process ☐ Past Due ☐	Pressure/Forced ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Wave/Twist in Tube ☐ Marks/Chatter ☐	Temperature/Cure ☐ Set-up ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Inspection Incomplete/Unqualified ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Instructions Incomplete/Unclear ☐ Drill Holes ☐	Power Loss/Surge ☐ Folio/Program ☐ Grain ☐ Weld ☐ Wrong Stock Pulled ☐ Out of Sequence ☐ Off-set ☐ Misabeled ☐ Fit/Function ☐ Misaligned/off center ☐	Positioned Wrong ☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Drawing ☐ Finish ☐ Misread ☐ Turning Sequence ☐	
OTHER : ☐						

DART AEROSPACE LTD		Work Order:	171102
Description: Crosstube Assembly (412 High Alt SS)		Part Number:	D412-664-443
Inspection Dwg: D412-664-443 Rev: B		Page 2 of 2	

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L=0"	310	309	308	309	.002	0.073"
READING 2 L=21.68	203	204	200	203	.004	
READING 3 L=43.87	320	311	309	319	.011	
READING 4 L=65.05	446	434	441	445	.012	
READING 5 L=86.73	320	314	311	317	.009	
READING 6 L=108.42	211	211	199	191	.020	
READING 7 L=130.1	311	313	310	306	.007	

Calibration Result

Actual Block Thickness: 200.500
 Silescan 250 Measured Thickness: 200.500

Measured by:	PMF	Audited by:	TE	Preliminary Approval:	
Date:	2018-07-15	Date:	1802015	Date:	

Rev	Date	Change	Revised by	Approved
A	14.06.24	New Issue	(P/O D412-664-403)	KJ
B	17.07.12	Dwg Rev updated		KJ

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: _____ Part No. _____ NCR No. _____	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS Skid-tube ☐ Machining ☐ Thermoforming ☐ Large Fab ☐ Cross tube ☐ Small Fab ☐ Finishing ☐ Composite ☐ Water Jet ☐ Prod. Eng. Coord. ☐ Rec/Store/Packaging ☐ Supplier ☐ Engineering ☐ Quality ☐ Other ☐			
Date :	Step #:	QTY Effective :		MRB (QSI042) Approval	
Description Work Order Deviation		Disposition		Completed By	
				Lead hand / Supervisor Approval Verification	
				QC / QA Coordinator Approval	
Root Cause		FAULT CATEGORY			
Environment ☐ Design ☐ Doc/Data ☐ Equip/Tooling ☐ Handling/Pre ☐ Material ☐ Internal Transport ☐ Tribal Knowledge ☐ LOA ☐ Substation ☐ Past Expiry Date ☐ Misidentified ☐ No Re-verification ☐ Operator ☐ Offset/Setup ☐ Supplier ☐ Training ☐ Use for Testing ☐ Poor Information ☐ Rushing ☐ Product Improvement ☐ Process Improvement ☐ Manufacturing Process ☐ Past Due ☐	Pressure/Forced ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Wave/Twist in Tube ☐ Marks/Chatter ☐ Temperature/Cure ☐ Set-up ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Inspection Incomplete/Unqualified ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Instructions Incomplete/Unclear ☐ Drill Holes ☐	Power Loss/Surge ☐ Folio/Program ☐ Grain ☐ Weld ☐ Wrong Stock Pulled ☐ Out of Sequence ☐ Off-set ☐ Misabeled ☐ Fit/Function ☐ Misaligned/off center ☐ Positioned Wrong ☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Drawing ☐ Finish ☐ Misread ☐ Turning Sequence ☐			
OTHER : ☐					

Item	Qty -443	Part Number	Description
1	X	D412-664-443	CROSSTUBE ASSEMBLY (412 HI AFT)
2	1	D6020-132	CROSSTUBE MATERIAL
3	2	D4910-1	CHAFING SHIELD
4	1	D5380-1	SUPPORT
5	1	D5380-3	SUPPORT BASE
6	4	MS21920-26	CLAMP
7	8	NAS1805-4P	NUT
8	8	NAS6704-21	BOLT
9	A/R	SCOTCH-WELD DP460	EPOXY ADHESIVE, 3M SCOTCH-WELD
10	A/R	PROSEAL 890 OR 1422	SEALANT

GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6020-132
FINISHED LENGTH = 130.10±0.060 (BEFORE BENDING/TRIMMING)
- FINISH: PREPARE TUBE PER QSI 005 SECTION 4.1.4
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
APPLY MATTE CLEAR COAT TO UNDERSIDE OF CROSSTUBE PER DART QSI 005 4.2
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (ZN C6-2, HATCHED AREA)
PAINT OUTSIDE PER DART QSI 005 4.2
AFTER PAINTING, REMOVE MASKING
- TOLERANCES: PER DART QSI 018 UNLESS OTHERWISE NOTED.
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: SCRIBE DART P/N "D412-664-443" AND B/N ON INSIDE OF CUFF PER DART QSI 044 6.4 (VIBRATING STYLUS)
- WEIGHT: 87.8 lb FINISHED WEIGHT
- PART IS SYMMETRIC ABOUT CENTERLINE.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.

BENDING

- BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 7% (BASED ON O.D.) IN LOWER HALF OF R35 BEND AND 6% (BASED ON O.D.) ON REMAINING TUBE.
- LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038. TO BE PERFORMED AFTER FINAL POST-BEND GRINDING. ANY ADDITIONAL GRINDING REQUIRES ANOTHER LPI INSPECTION.

ASSEMBLY

- LOCATE THE D5380-1/3 SUPPORTS ONTO THE CROSSTUBE AS SHOWN IN THE ASSEMBLY DETAIL.
- ABRADE THE MATING SURFACES OF THE CROSSTUBE AND D5380-1/3 SUPPORT HALVES WITH 180-GRIT SANDPAPER. SATURATE A CLEAN CLOTH WITH MEK, 4105S WASH-N-WIPE DEGREASER OR EQUIVALENT AND WIPE CLEAN UNTIL THERE IS NO RESIDUE.
- APPLY A 0.04" TO 0.07" THICK LAYER OF 3M DP460 ADHESIVE ONTO THE CONCAVE SURFACE OF THE D5380-1 SUPPORT AND THE D5380-3 SUPPORT BASE.
- INSTALL D5380-1 SUPPORT ONTO THE CROSSTUBE AS SHOWN IN THE ASSEMBLY DETAIL AND INSTALL QTY (2) NAS6704-21 BOLTS INTO OPPOSING CORNERS OF THE D5380-1 SUPPORT. ALIGN THE BOLTS WITH THE HOLES ON D5380-3 SUPPORT BASE AND INSTALL ONTO THE CROSSTUBE.
- INSTALL THE REMAINING QTY (6) NAS6704-21 BOLTS AND QTY (8) NAS1805-4P NUTS, THEN EVENLY TORQUE THE NUTS IN A CRISS-CROSS PATTERN TO 60-70 IN-LBS. ENSURE A MINIMUM OF 1.5 THREADS ARE IN SAFETY.
- WIPE OFF EXCESS ADHESIVE USING A CLEAN CLOTH SATURATED WITH MEK, 4105S WASH-N-WIPE DEGREASER OR EQUIVALENT
- ALLOW DP460 ADHESIVE TO CURE FOR 24 HOURS.
- FILLET SEAL THE EDGES OF THE D5380-1/3 SUPPORT HALVES WITH PROSEAL PR1422 B1/2 OR PR890 B1/2 ALLOW PROSEAL TO CURE FOR 24 HOURS.
- IF NOT ALREADY PRESENT ON D4910-1 CHAFING SHIELD, APPLY A 0.015" TO 0.020" THICK COAT OF PROSEAL 890/1422 ON INSIDE CONCAVE SURFACE OF D4910-1 CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS.
- RECOAT THE D4910-1 CHAFING SHIELD WITH 0.015"-0.020" OF PROSEAL 890/1422 AND IMMEDIATELY INSTALL ONTO THE CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS. ENSURE THE D4910-1 CHAFING SHIELDS ARE WRAPPED TIGHTLY.
- TORQUE CLAMPS ON D4910-1 CHAFING SHIELD 40 TO 50 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON MS21920-26 CLAMPS AFTER ADHESIVES HAVE CURED FOR 24 HOURS.

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SUBJECT TO AMENDMENT

WITHOUT NOTICE
WORK ORDER

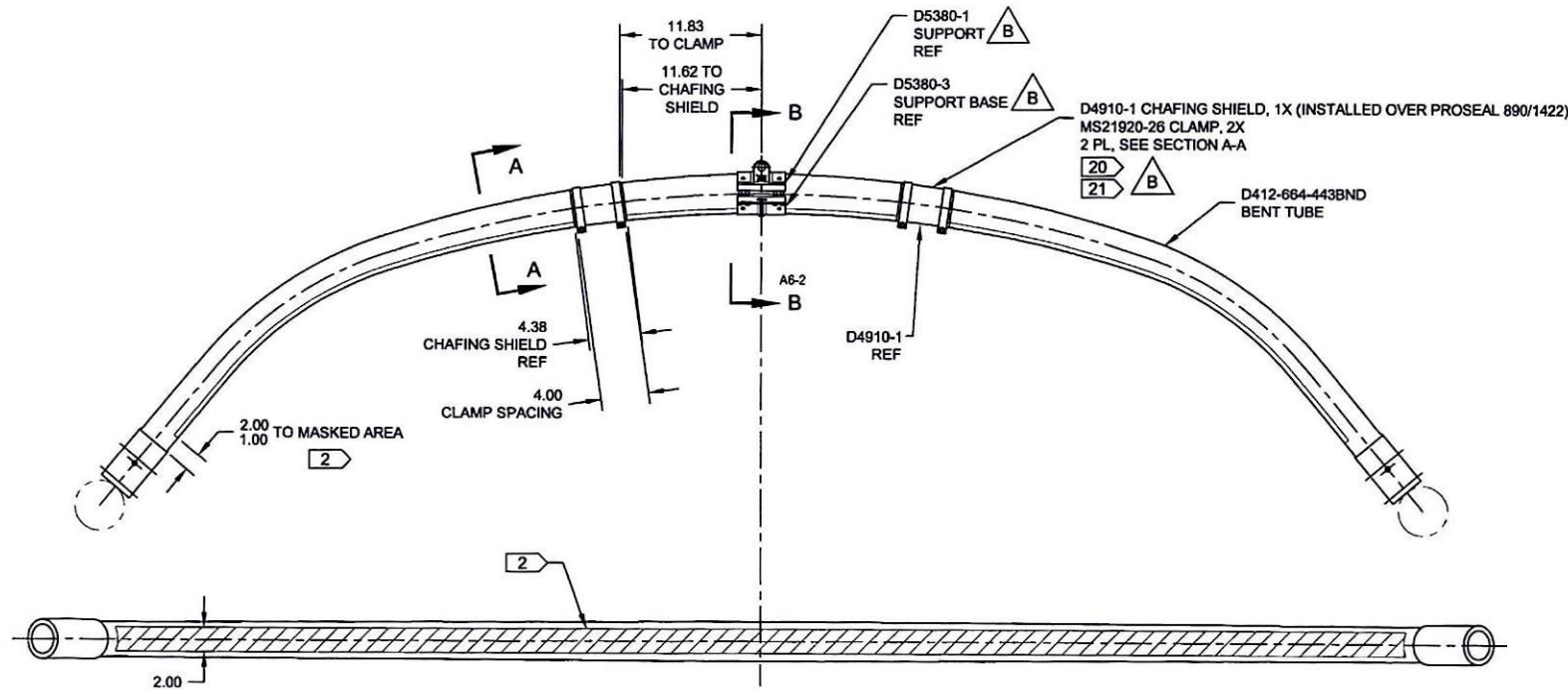
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1801-29

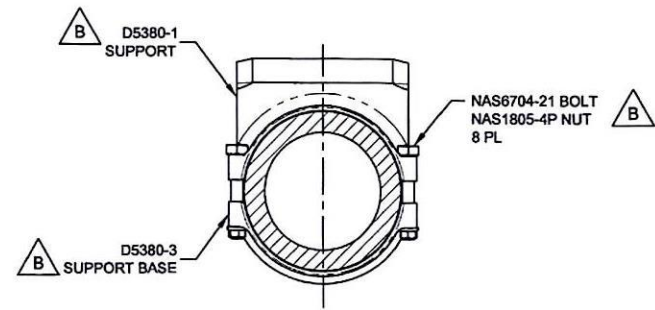
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2017 JUN 21
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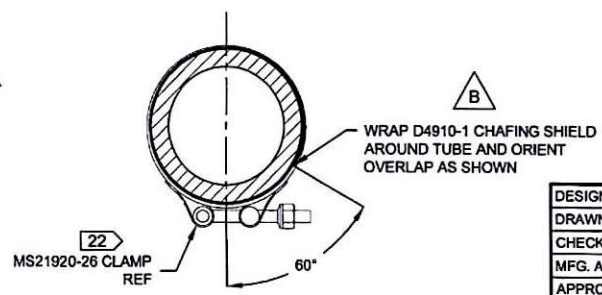
B	ADD ITEMS 4, 5, 7, AND 8. DELETED ITEMS D4909-1, MS21920-28 & D3595-063-530. NOTE 2 UPDATED FOR TUBE FINISH. ALL ASSEMBLY NOTES REWRITTEN. SHEET 2 SECTION A-A ANGLE DIM ADDED FOR CHAFING SHIELD INSTALLATION. ASSEMBLY DETAIL AND SECTION B-B UPDATED FOR INSTALLATION OF D5380-1/3.	AJS	16.11.03
A	NEW ISSUE	CP	14.04.01
REV.	DESCRIPTION	BY	DATE
DESIGN	CP	DART AEROSPACE LTD	
DRAWN	AJS	HAWKESBURY, ONTARIO, CANADA	
CHECKED	MJS	DRAWING NO.	REV. B
MFG. APPR.	JLH	D412-664-443	SHEET 1 OF 4
APPROVED	8/1	TITLE	SCALE
DE APPR.	#	CROSSTUBE ASSY (412 HI AFT)	NTS
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SYM
D412-664-443
 ASSEMBLY DETAIL



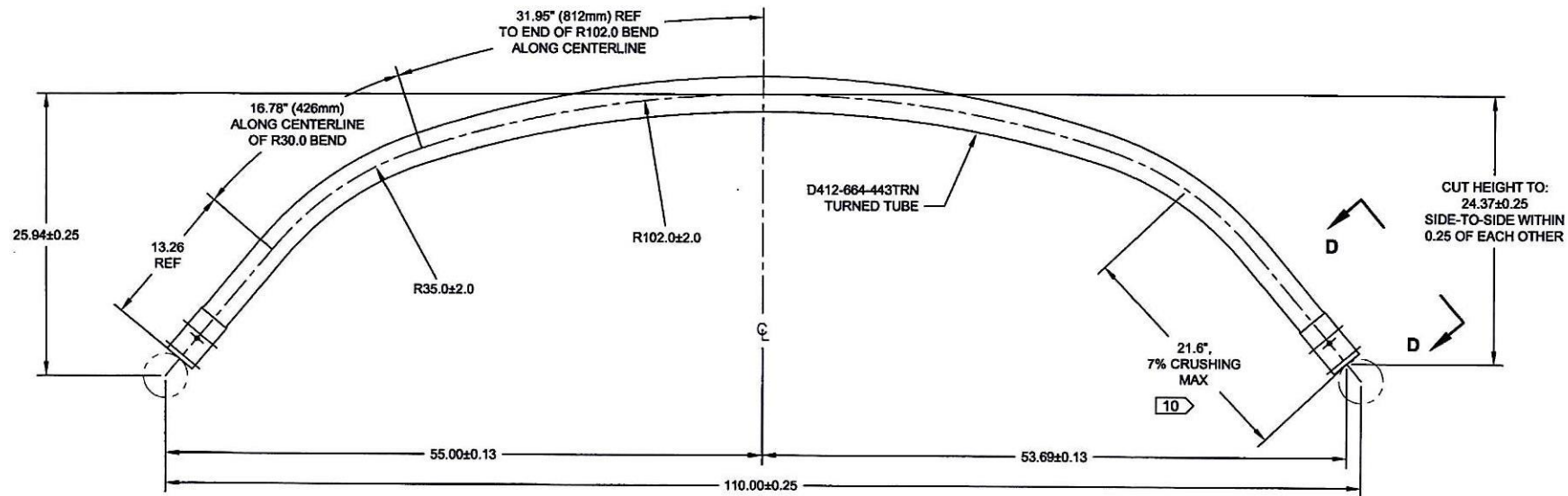
SECTION B-B
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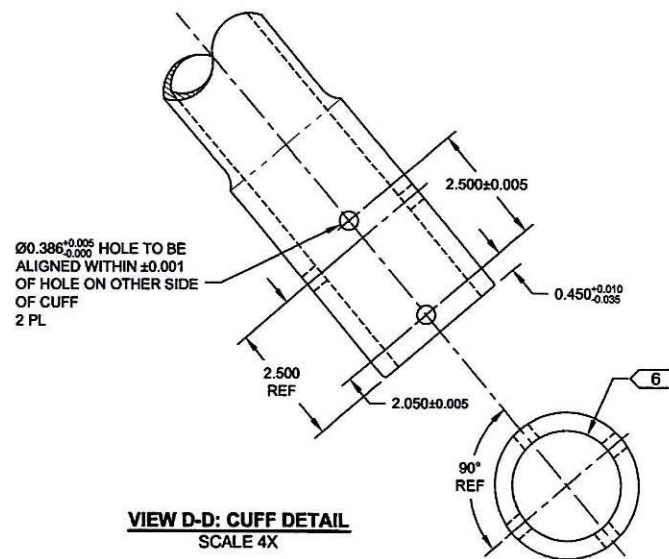
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APPROVED	<i>[Signature]</i>	TITLE	SCALE
DE APPR.	<i>[Signature]</i>	CROSSTUBE ASSY (412 HI AFT)	NTS
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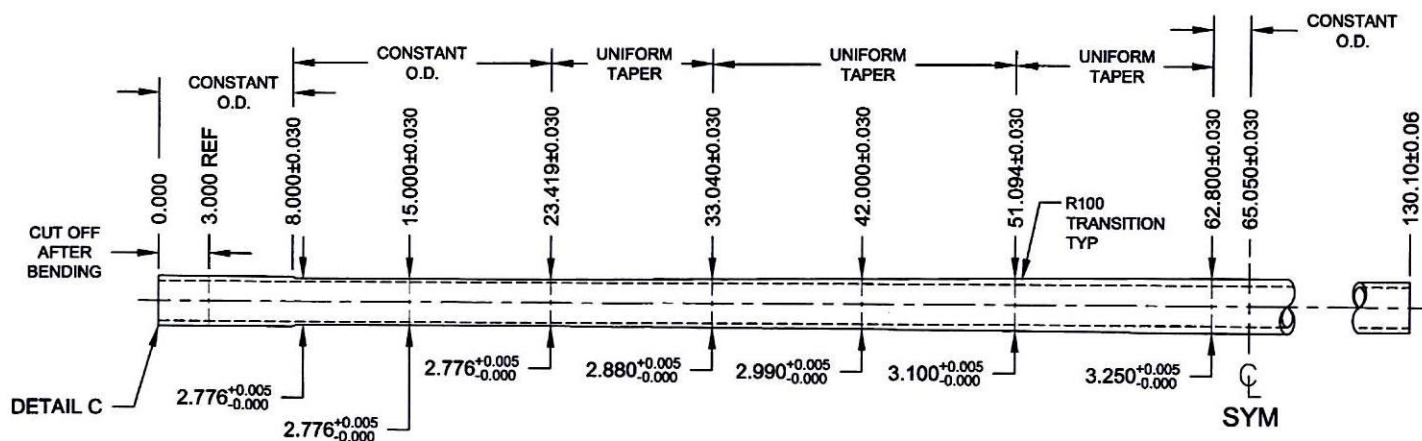
D412-664-443BND 10
BENDING DETAIL



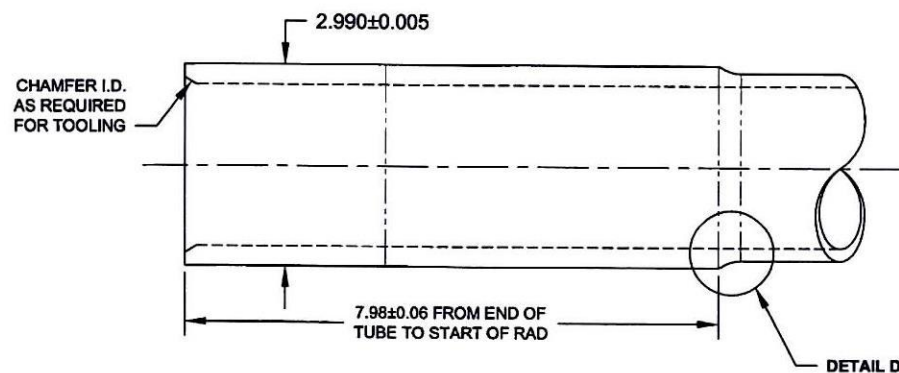
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2017 JUN 21 *ap*

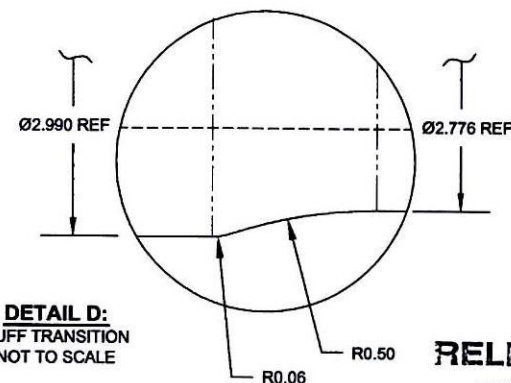
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CHECKED	<i>M. J.</i>	DRAWING NO.	REV. B
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APPROVED	<i>[Signature]</i>	TITLE	SCALE
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D412-664-443TRN
TURNING DETAIL



DETAIL C:
CUFF TRANSITION
SCALE 4X



DETAIL D:
CUFF TRANSITION
NOT TO SCALE

RELEASED

2017 JUN 21

DESIGN	CP	DART AEROSPACE LTD	
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CHECKED	<i>[Signature]</i>	DRAWING NO.	REV. B
MFG. APPR.	<i>[Signature]</i>	D412-664-443	SHEET 4 OF 4
APPROVED	<i>[Signature]</i>	TITLE	SCALE
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